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The Patent Office

Cardiff Road
Newport
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11SEP02 E747362-1 000115
P01/7700 0.00-0221019.3

1. Your reference **A2688**

2. Patent application number *(the Patent Office will fill in this part)* 0221019.3 11 SEP 2002

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

Automotive Products Italia (SV) S.p.A.
Corso Marconi 160
17014 Cairo Montenotte
Savona
Italy

Patents ADP number *(if you know it)* 8139974900

If the applicant is a corporate body, give the country/state of its incorporation **Italy**

4. Title of the invention **PARKING BRAKES**

5. Name of your agent *(if you have one)* **R Morrall**

"Address for service" in the United Kingdom to which all correspondence should be sent

(including the postcode)

Automotive Products Group Ltd
Patent Department
PO Box 2085
Tachbrook Road
Leamington Spa
Warwickshire
CV31 3ZL

Patents ADP number *(if you know it)* 6477293004

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications *(if you know it)* the or ... application number

Country	Priority application number *(if you know it)*	Date of filing *(day/month/year)*

7. If this application is divided or otherwise derived from an earlier UK application

Number of earlier application	Date of filing *(day/month/year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *Answer 'Yes' if:*
... named in part 3 is not an inventor, or
... inventor who is not named as an applicant, or
... named applicant is a corporate body:
See note (d)

YES

Patents Form 1/77

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Continuation sheets of this form	
Description	8
Claim(s)	2
Abstract	—
Drawings	9 +9 gmc

10. If you are also filing any of the following, state how many against each item.

Priority documents	
Translations of priority documents	
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	*YES* ✓
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(please specify)*	

11. I/We request the grant of a patent on the basis of this application

Signature R Morrall Date 10/9/02

R Morrall - Agent

12. Name and daytime telephone number of person to contact in the United Kingdom **R Morrall 01926 473178**

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DUPLICATE

A2688GB

PARKING BRAKES

This invention relates to parking brakes and in particular to parking brakes hereinafter referred to as of the type described which comprise a drum containing a pair of brake shoes, a handbrake lever pivoted adjacent one end on one of the shoes, and a strut extending between a first abutment on the handbrake lever and a second abutment on the other brake shoe so that pivoting of the handbrake lever relative to said one shoe moves the strut which in turn moves the other shoe away from said one shoe to bring the shoes into contact with the drum and thus apply the parking brake.

Parking brakes of the type described are well known and work efficiently particularly when they are actuated manually by a conventional driver operated lever. There is, however, an increasing requirement to provide parking brakes which are capable of electric motor application in order to dispense with the conventional manually operated lever.

One problem associated with electric motor actuated parking brakes is that the actuation system often has a relatively limited movement capability and this can therefore provide difficulties in ensuring efficient and sufficiently long lived actuation of the parking brake function when teamed with a parking brake of the type described.

It is an object of the present invention to provide an improved form of parking brake of the type described which at least reduces the above difficulty.

Thus in accordance with the present invention there is provided a parking brake of the type described in which an automatic adjusting means is provided between the ends of the shoes remote from the strut, the adjusting means being actuated by pivoting movement of the handbrake lever relative to said one shoe beyond a predetermined distance to increase the effective length of the adjusting means thus moving the ends of the shoes apart to compensate for wear of the shoes.

A parking brake in accordance with the present invention thus provides a simple but effective means of continually adjusting to compensate for the wear of the shoes thus ensuring that the free travel of the shoes before the drum is contacted is kept to a minimum. This is of particular advantage when the parking brake is actuated electrically as discussed earlier since such electrically actuation systems often have relatively limited travel.

Preferably the automatic adjustment means includes a screw-threaded device which is rotated to increase its effective length by a pawl and ratchet operated in response to pivoting movement of the handbrake lever.

Preferably the handbrake lever moves up a ramp on an adjusting lever as the shoes wear and the pivoting movements of the handbrake lever increases. This movement of the operating member causes the pawl to move up and down a ratchet tooth with which it is currently engaged so that after the movement of the handbrake lever up the ramp exceeds a predetermined amount (indicating a predetermined amount of wear of the shoes) the movement of the pawl is sufficient to engage the next tooth on the ratchet so that during the next release of the handbrake lever the pawl rotates the ratchet under the action of a bias force to increase the effective length of the adjusting means and hence move the shoes further apart.

The pawl may be of a bi-metallic construction so that should the temperature of the brake become excessively high (which might lead to an over adjustment of the brake) the pawl will be deflected out of engagement with the ratchet wheel to prevent adjustment of the effective length of the adjusting means.

The automatic wear adjusting means of the present invention is also particularly suitable for use with the biased wedge clearance adjustment device described and claimed in the Applicant's co-pending patent application no.....(Applicant's reference A2687).

The present invention will now be described, by way of example only, with reference to the accompanying drawings in which:-

Figure 1 shows a side view of a parking brake in accordance with the present invention;

Figures 2 and 3 show further details of a biased wedge clearance adjusting device used in the parking brake of Figure 1;

Figure 4 shows part of the automatic wear adjusting means of Figure 1 and its interaction with the handbrake lever on a larger scale;

Figure 5 shows the same portion of the automatic wear adjusting means viewed from the other side;

Figure 6 shows a perspective view of the portion of the automatic wear adjusting means as viewed from the same side as Figure 5;

Figure 7 shows the automatic wear adjusting means viewed partly in section;

Figure 8 shows a view generally corresponding to Figure 6 of a modified form of automatic wear adjusting means including a bi-metallic pawl, and

Figures 9 and 10 show perspective and part sectional views respectively of an alternative automatic wear adjusting means in accordance with the present invention.

Referring to Figures 1 to 7 of the drawings these show a parking brake 10 for use in a so-called drum in disc brake in which a pair of shoes 11 and 12 with friction linings 11b and 12b respectively mounted on a backplate 13 with one end of the shoes being pulled against a fixed backplate mounted abutment 14 by return spring 15 and the other end of the shoes pivoting on an automatic wear adjusting means 16 in accordance with the present invention which will be described in more detail below. Return spring 29 also acts between the lower ends 11c and 12c of brake shoes 11 and 12.

The shoes are contained within a drum indicated diagramatically at 17 in figure 1 and the shoes are arranged to be brought into contact with the drum 17 by an actuating mechanism which comprises a handbrake lever 18 which is pivoted adjacent one end by pin 19 on brake shoe 11. A strut 20 which has forked ends 20a and 20b acts between a first abutment 18a on handbrake lever 18 and a second abutment associated with brake shoe 12 in the form of a plate 22 which is riveted to the shoe 12 at 23 and 24. A biased wedge 21, best seen in Figures 2 and 3, acts between the root 20c of forked end 20b and a plate 22.

The biased wedge 21 has one edge 21a which slides down an edge 22a of plate 22 and a further edge 21b which contacts the root 20c of forked end 20b of strut 20. The wedge 21 is biased between the surface 22a and the root 20c by a wire spring 23 which encircles rivet 24 and has one end 23a engaging a slot 24 in wedge 21 and the other end 25 bearing against the inside of the table 12a of brake shoe 12.

This biased wedge arrangement is the subject of the Applicant's co-pending patent application No..... (Applicant's reference A2687).

Thus, as will be appreciated, any manufacturing or assembling clearances which may be present between the abutment surface 18a on handbrake lever 18 and the co-operating root 20d of forked end 20a of strut 20 and between the root 20c and the biased wedge 21 are automatically taken up due to the biasing effect of the wire spring 23 so that there is no lost motion in the parking brake actuating mechanism. Thus all pivoting of the handbrake lever 18 relative to the brake shoe 11 by, for example, a cable 26 which is attached to the lower end 18c of handbrake lever results in immediate movement of the strut 20 and the other brake shoe 12. Also any changes in the size of these contacting components during use of the brake (e.g. caused by Brinnelling due to the high loads imposed) will be taken-up by the biased wedge 21.

As will be appreciated if the cable 26 is operated by an electric motor it is particularly important that all lost motion in the actuating mechanism should be eliminated and this is efficiently and cheaply carried out by the biased wedge 21. It will also be noted that

clearances between the strut 20, lever 18 and shoe 12 are multiplied by a factor of approximately 5 at the lower end 18c of lever 18 due to the lever ratio thus making their elimination even more important.

The cable 26 can be attached to the lower end 18c of handbrake lever 18 by any suitable arrangement. For example the spring-loaded pivoting latch arrangement disclosed in the Applicant's co-pending PCT application number WO 98/40640 may be employed in which the nipple 27 on cable 26 is fed into its latched position shown in Figures 1 and 4 down the centre of a guide spring 28 which also acts as a return spring for lever 18.

The automatic wear adjusting means 16 of the present invention will now be described in detail.

The wear adjusting means 16 of the present invention essentially comprises a variable length strut 30 in the form of a first strut member 31 having a diametral slot 31a which receives the lower end 11c of brake shoe 11 and which has a screw threaded portion 31b which is threadably received in a toothed ratchet wheel 32. Screw threaded portion 31b of strut member 31 is received with clearance in a bore 33 of a strut member 34 which also has a diametral slot 34a which receives the lower end 12c of shoe 12. Thus the strut members 31 and 34 are held against rotational movement relative to the shoes 11 and 12 respectively and the effective total length of the strut 30 can be varied by screwing the ratchet wheel 32 along the screw threaded portion 31b of strut member 31 since strut member 34 reacts against the right hand side of ratchet wheel 32.

In order to compensate for the wear of the linings 11b and 12b of shoes 11 and 12 it is simply necessary to rotate the ratchet wheel 32 to displace the lowers ends 11c and 12c of the shoes 11 and 12 away from each other to compensate for lining wear.

Adjustment of the effective length of the variable length strut 30 is made automatically in response to the increasing movement of handbrake lever 18 relative to shoe 11 as the shoes wear. This increased movement is sensed by an adjusting lever 35 which is pivoted on shoe

11 by rivet 36. Adjusting lever 35 includes a ramp 37 which is contacted by the lower edge 18d of lever 18 when the handbrake is applied by cable 26 and a pawl 38 which contacts the teeth of ratchet wheel 32. As will be appreciated, as the brake linings 11b and 12b wear the movement of lever 18 necessary to apply the parking brake will increase so that the lower edge 18d of lever 18 will move further and further up ramp 37. This movement of the lower edge of lever 18d up ramp 37 pivots the adjusting lever 35 about rivet 36 in a counter clockwise sense as viewed in Figures 5 and 6 to move the pawl 38 on lever 35 up and down the tooth 32a which the pawl currently engages. Each time the handbrake lever is released and the lower edge 18d moves back down the ramp 37 the adjusting lever 35 is pivoted back clockwise as viewed in Figures 3 and 4 about pivot 36 by a bias spring 39 until a stop surface 35a contacts the table 11a of shoe 11.

Eventually the movement of the lower edge 18d of lever 18 up ramp 37 results in the lever moving over the top of the ramp and this corresponds to sufficient movement of the pawl 38 up the contacting ratchet wheel 32a to cause the pawl to slide over the top of tooth 32a to engage the next tooth 32b of the ratchet wheel. Figure 7 shows the pawl 38 about to pass over the top of tooth 32a to engage tooth 32b. On the next retraction of the lever 18 following the engagement of the new tooth 32b the bias spring 39 rotates the ratchet wheel 32 anticlockwise (as viewed in Figure 6 or 7) thus increasing the effective length of strut 30 to adjust for the wear of the shoe linings 11b and 12b which has occurred.

As will be appreciated the above mechanism provides a simple but effective means of continually adjusting for the wear of the linings 11b and 12b of the brake shoes. This ensures that the free travel before the brake shoes contact the associated drum 17 is kept to a minimum which is of particular advantage when the parking brake is actuated electrically as discussed earlier since such electrically actuation systems often have relatively limited travel.

Figure 8 shows a modification of the arrangement shown in figures 1 to 7 in which the pawl 38 formed integrally with adjusting lever 35 is replaced by a bi-metal pawl 40 arranged so that should the general temperature of the parking brake become excessively high (which might lead to over adjustment of the clearances etc.) the bi-metal pawl will tend to bend away

from the ratchet wheel teeth thus disengaging the teeth and preventing any adjustment of the effective length of strut 30 until the temperature of the brake has fallen to a level at which the bi-metal element once again engages the ratchet wheel teeth.

Figures 9 and 10 show an alternative arrangement in which instead of using the bias spring 39 to provide the motive force for rotating the ratchet wheel 32 the teeth on ratchet wheel 32 are reversed so that the movement of the handbrake lever 15 and its co-operation with the ramp 37 is arranged to pivot the adjusting lever 35 anti-clockwise about the rivet 36 when viewed in Figure 9 thus causing the end of pawl 38 to contact the root portion 32c of tooth 32a and thus rotate the ratchet wheel 32 slightly in a clockwise sense as viewed in Figures 9 and 10. Thus each time the lower edge 18d of handbrake lever 18 moves up ramp 37 there is a tendency for the ratchet wheel 32 to be rotated slightly in a clockwise sense if any wear of the associated brake shoes has taken place. On each retraction of the handbrake lever 18 the spring 39 draws the end of pawl 38 up the ramp 32d of the next tooth 32b as the adjusting lever 35 is moved back so that its stop surface 35a contacts the table 11a of shoe 11. Eventually the clockwise rotation of the ratchet wheel resulting from and the coaction of the lower edge 18d of lever 18 and ramp 37 will have rotated the ratchet wheel 32 sufficiently clockwise as viewed in Figures 9 and 10 so that, on retraction of the adjusting lever 35 by spring 39, the end of pawl 38 rides over the tip 32e of tooth 32b and engages the root 32f of the next tooth 32b. Thus there is a continuous small rotation of ratchet wheel 32 as the associated brake shoes 11 and 12 wear.

In the arrangement shown in Figures 9 and 10 the pawl 38 is of a bi-metallic construction, similar to that shown in Figure 8, which is riveted to the adjusting lever 35 and which will disengage the teeth of ratchet wheel 32 if the temperature of the parking brake becomes excessive in order to prevent over adjustment of the effective length of strut 30.

Although in the construction described above a biased wedge adjusting arrangement in accordance with the Applicant's co-pending patent application no..... (Applicant's reference A2687) has been described in use in connection with strut 20, it will be understood that the automatic wear adjusting means of the present invention which is located between the

lower ends 11c and 12c of the shoes 11 and 12 may be used without such a biased wedging arrangement when the elimination of clearances in the strut actuating mechanism is less essential.

Also, although described as being particularly useful in connection with electrically operated parking brakes the automatic wear adjusting means of the present invention would be suitable for use with hand brakes in which cable 26 is operated manually since it provides a handbrake function whose free travel is automatically adjusted and therefore remains effective throughout the service life of the vehicle. Such an arrangement is a considerable improvement on current parking brake arrangements which require manual adjustment of the parking brake function which inevitably leads to the parking brake becoming less effective than desirable between the normal service intervals of the vehicle.

CLAIMS

1. A parking brake of the type described in which an automatic adjusting means is provided between the ends of the shoes remote from the strut, the adjusting means being actuated by pivoting movement of the handbrake lever relative to said one shoe beyond a predetermined distance to increase the effective length of the adjusting means thus moving the ends of the shoes apart to compensate for wear of the shoes.

2. A parking brake according to claim 1 in which the automatic adjustment means includes a screw-threaded device which is rotated to increase its effective length by a pawl and ratchet operated in response to pivoting movement of the handbrake lever.

3. A parking brake according to claim 1 or 2 in which the handbrake lever moves up a ramp on an adjusting lever as the shoes wear and the pivoting movements of the handbrake lever increases.

4. A parking brake according to claim 2 and 3 in which the movement of the operating member causes the pawl to move up and down a ratchet tooth with which it is currently engaged so that after the movement of the handbrake lever up the ramp exceeds a predetermined amount (indicating a predetermined amount of wear of the shoes) the movement of the pawl is sufficient to engage the next tooth on the ratchet so that during the next release of the handbrake lever the pawl rotates the ratchet under the action of a bias force to increase the effective length of the adjusting means and hence move the shoes further apart.

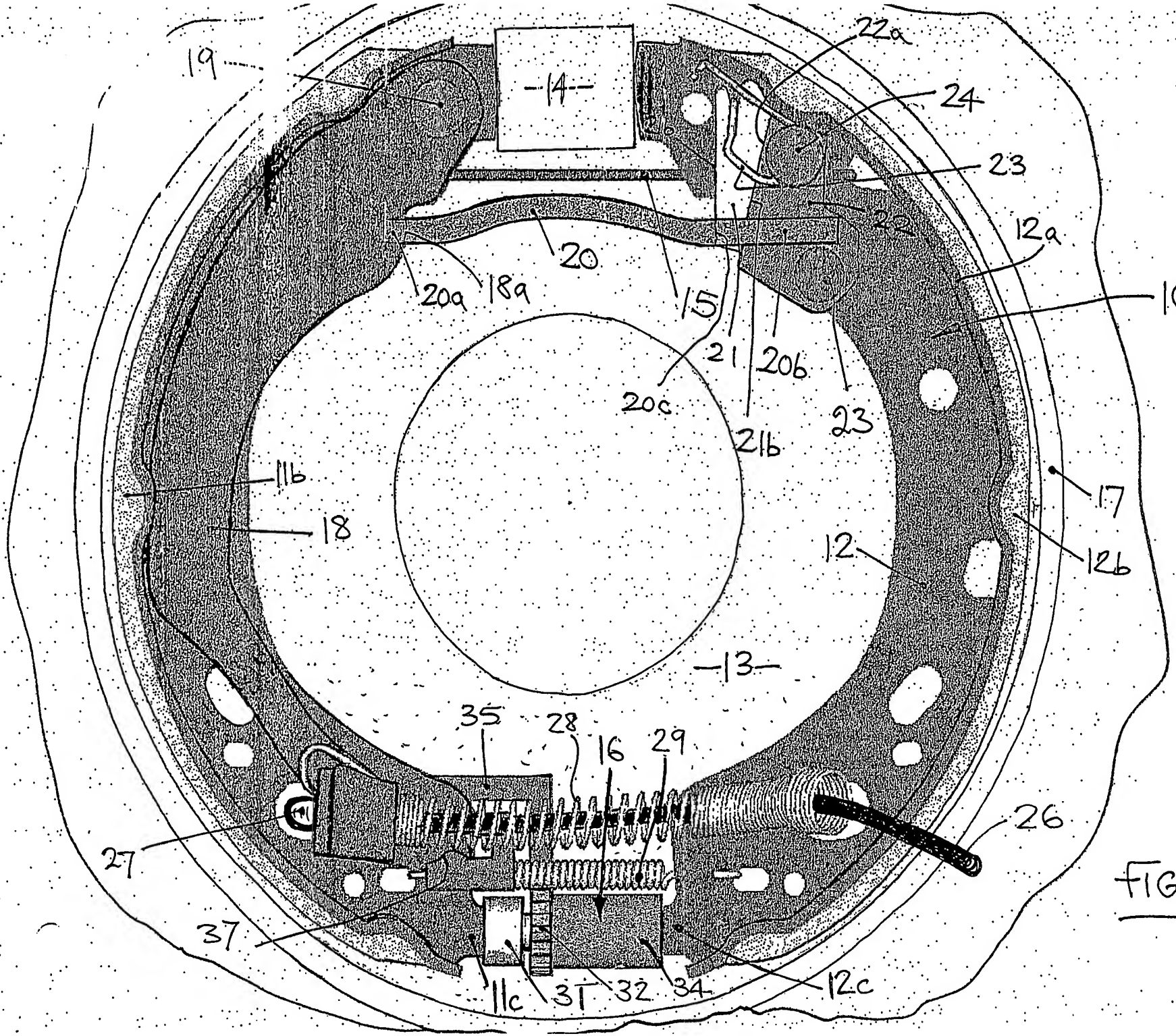
5. A parking brake according to claim 2 or 3 in which the movement of the operating member up the ramp causes the pawl to push on the root of a ratchet wheel tooth to tend to rotate the ratchet wheel to take up wear of the shoes, the pawl being retracted relative to the ratchet on each brake release, and the arrangement being such that when retraction of the pawl exceeds a predetermined amount, indicating the presence

of a predetermined amount of wear of the shoes, the pawl snaps into the root of the next tooth and the adjustment process is repeated.

6. A parking brake according to claim 2 or 5 in which the pawl is of a bi-metallic construction so that should the temperature of the brake become excessively high (which might lead to an over adjustment of the brake) the pawl is deflected out of engagement with the ratchet wheel to prevent adjustment of the effective length of the adjusting means.

7. A parking brake according to any one of claims 1 to 6 in which the handbrake lever is actuated electrically.

8. A parking brake of the type described constructed and arranged substantially as hereinbefore described with reference to and as shown in the accompanying drawings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16
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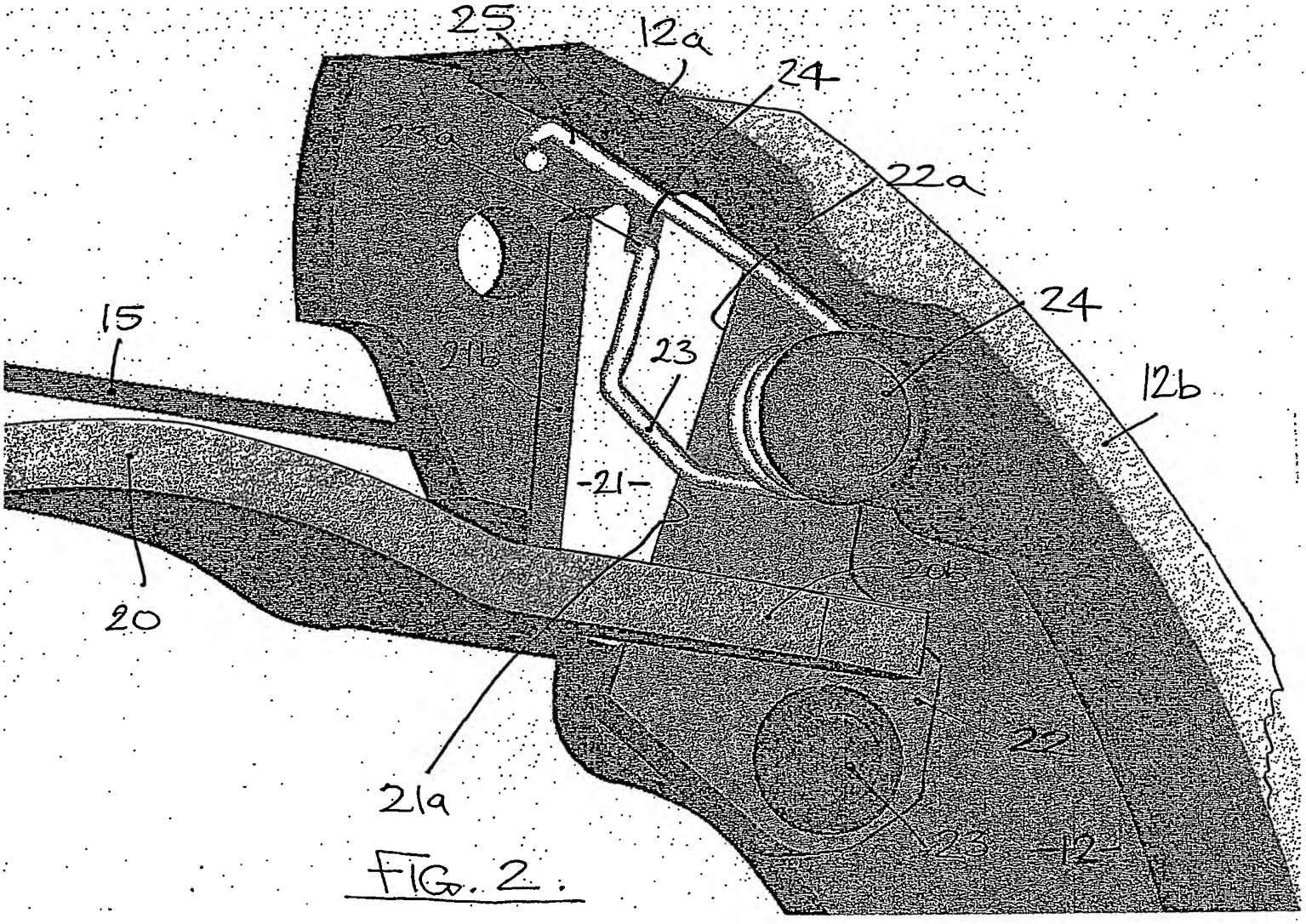
26
27
37
11c
31
32
34
12c

FIG. 1.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12

FIG. 2.

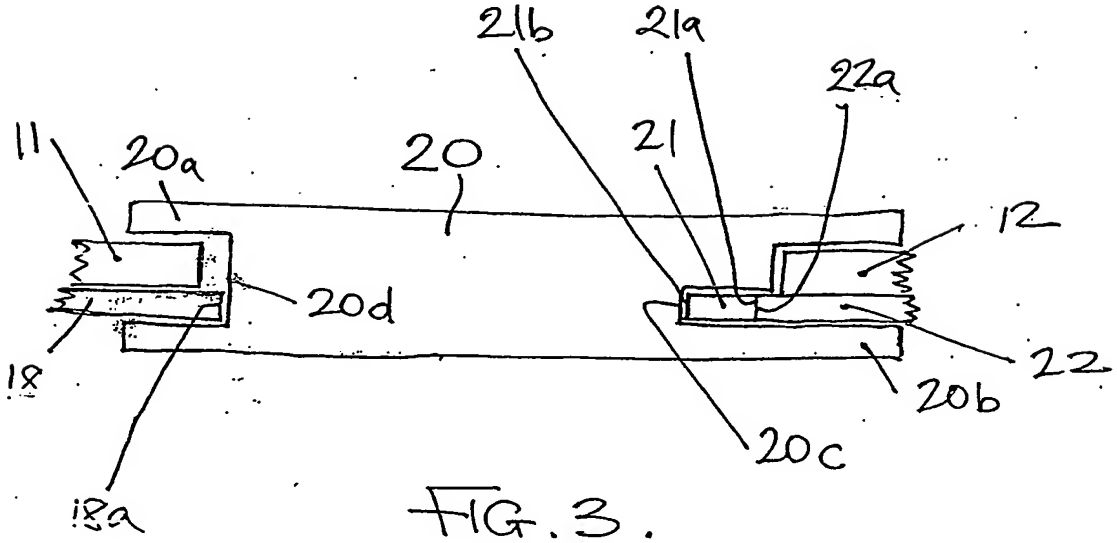
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FIG. 3.

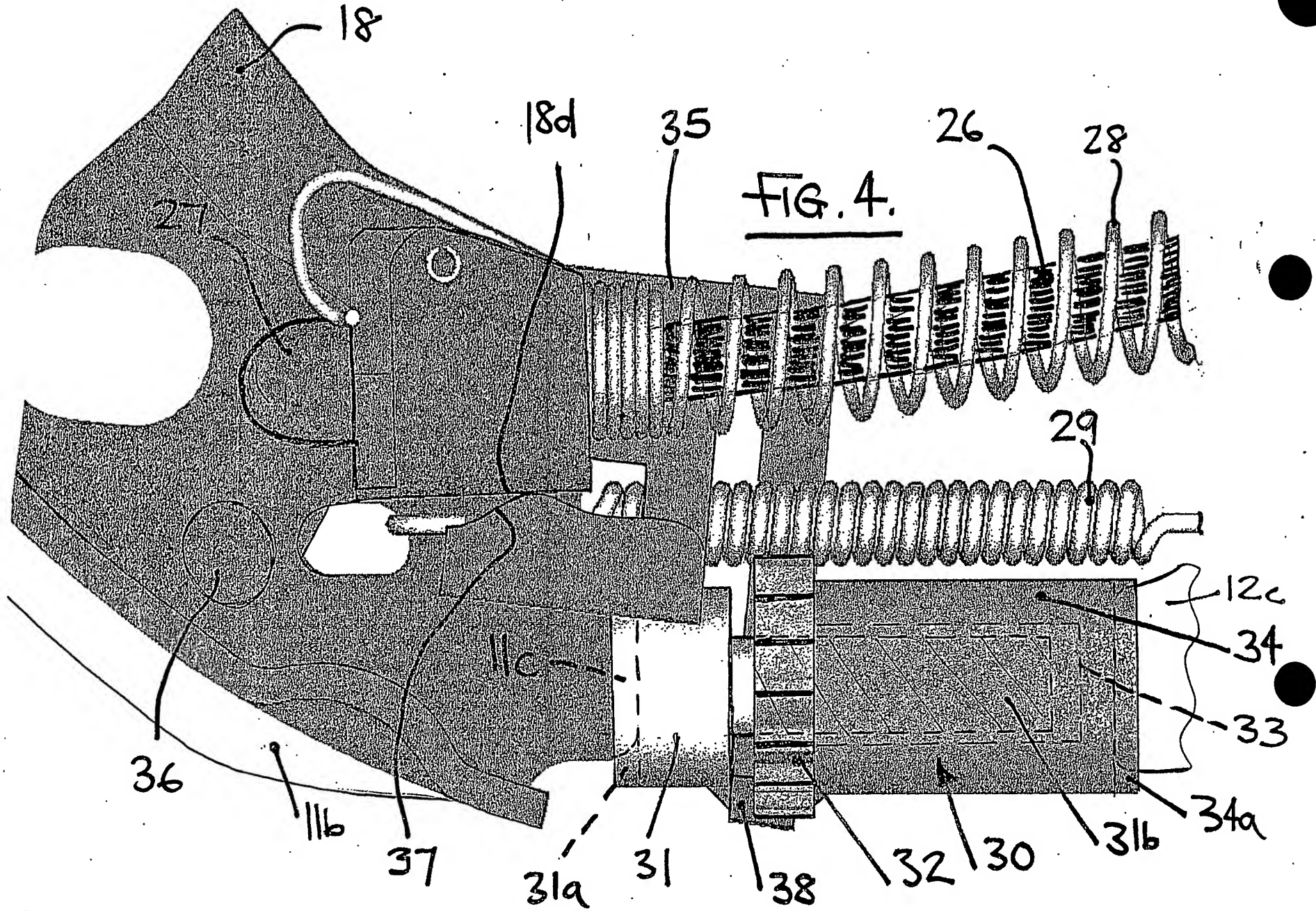


FIG. 4.

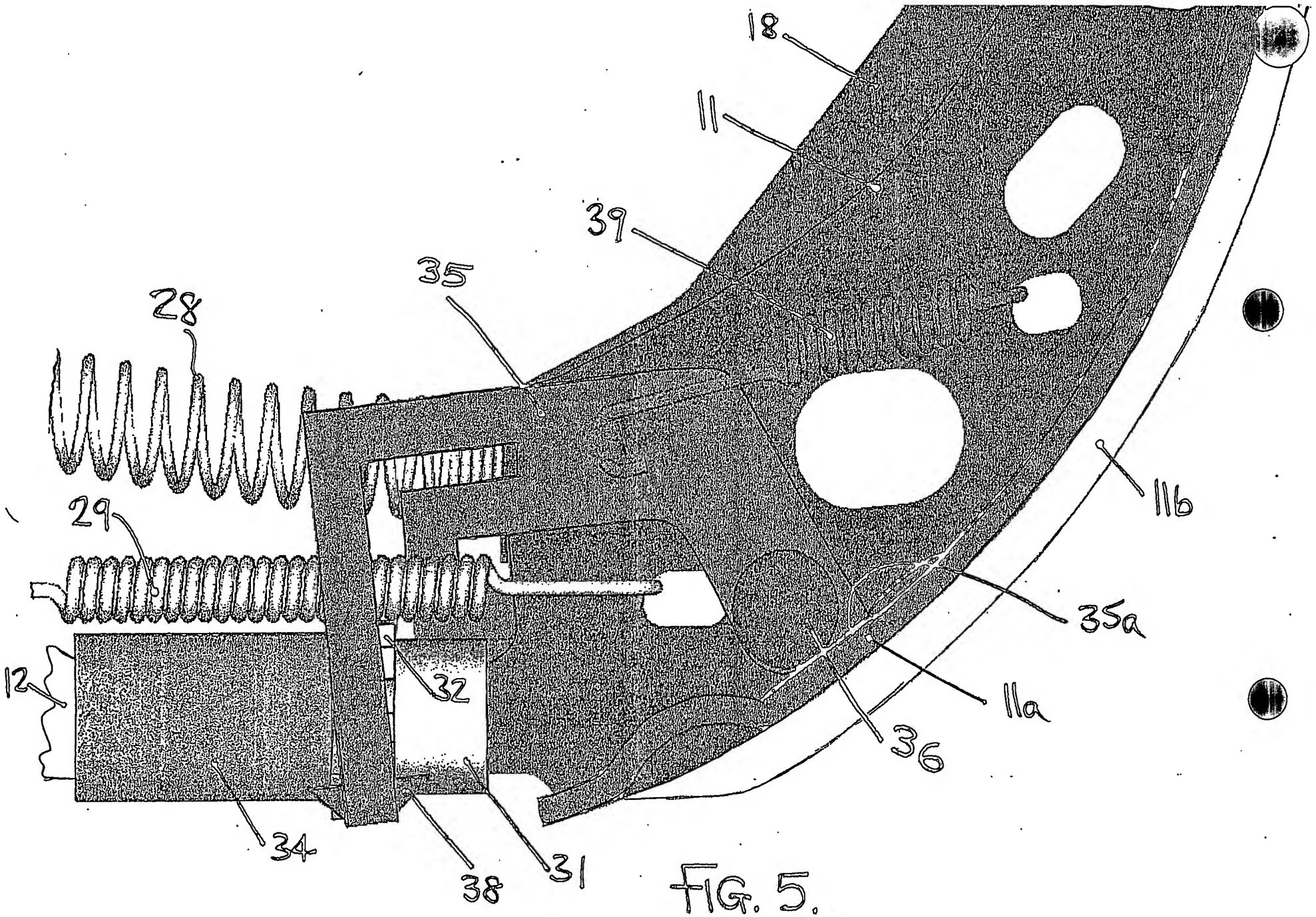


FIG. 5.

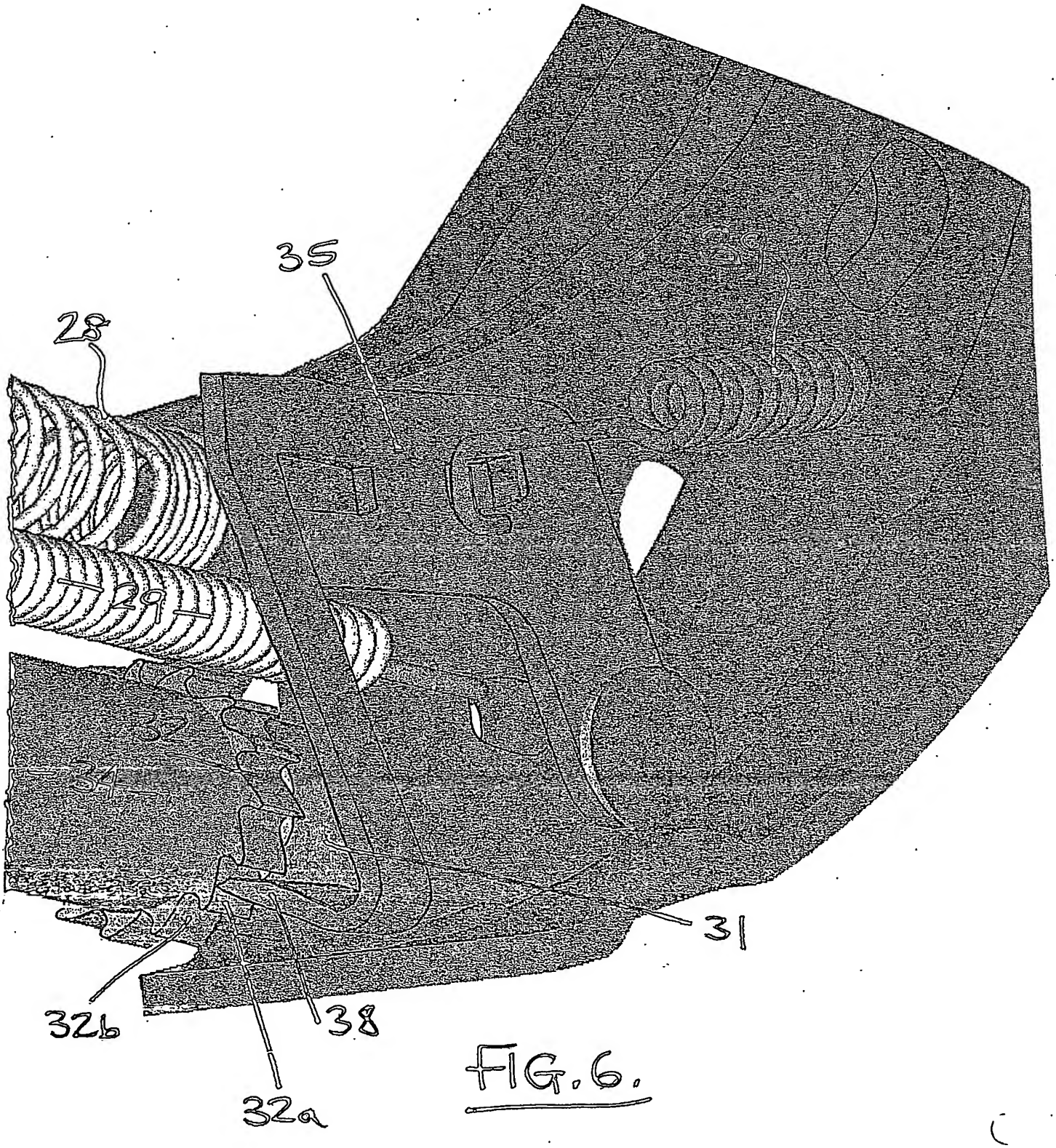


FIG. 6.

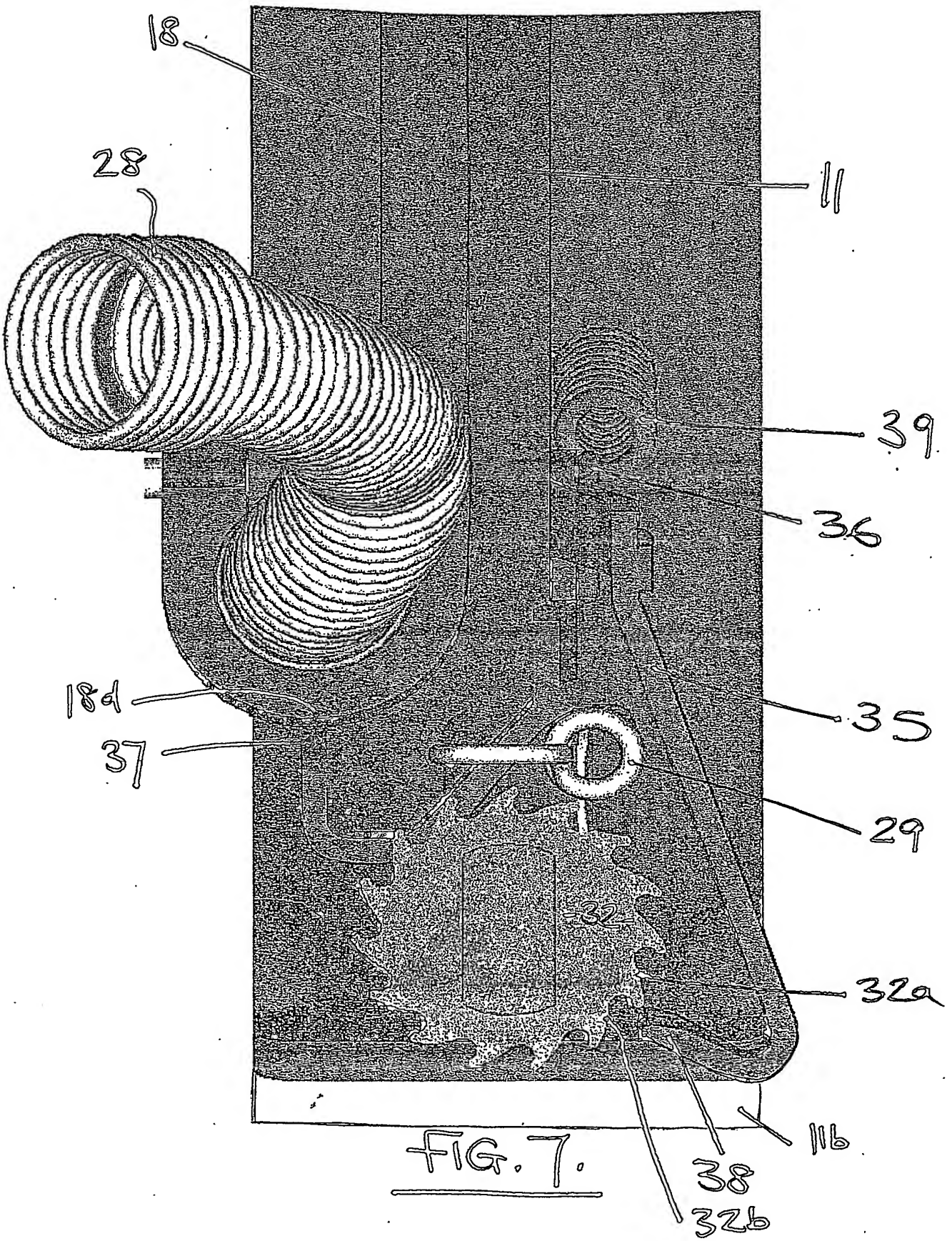
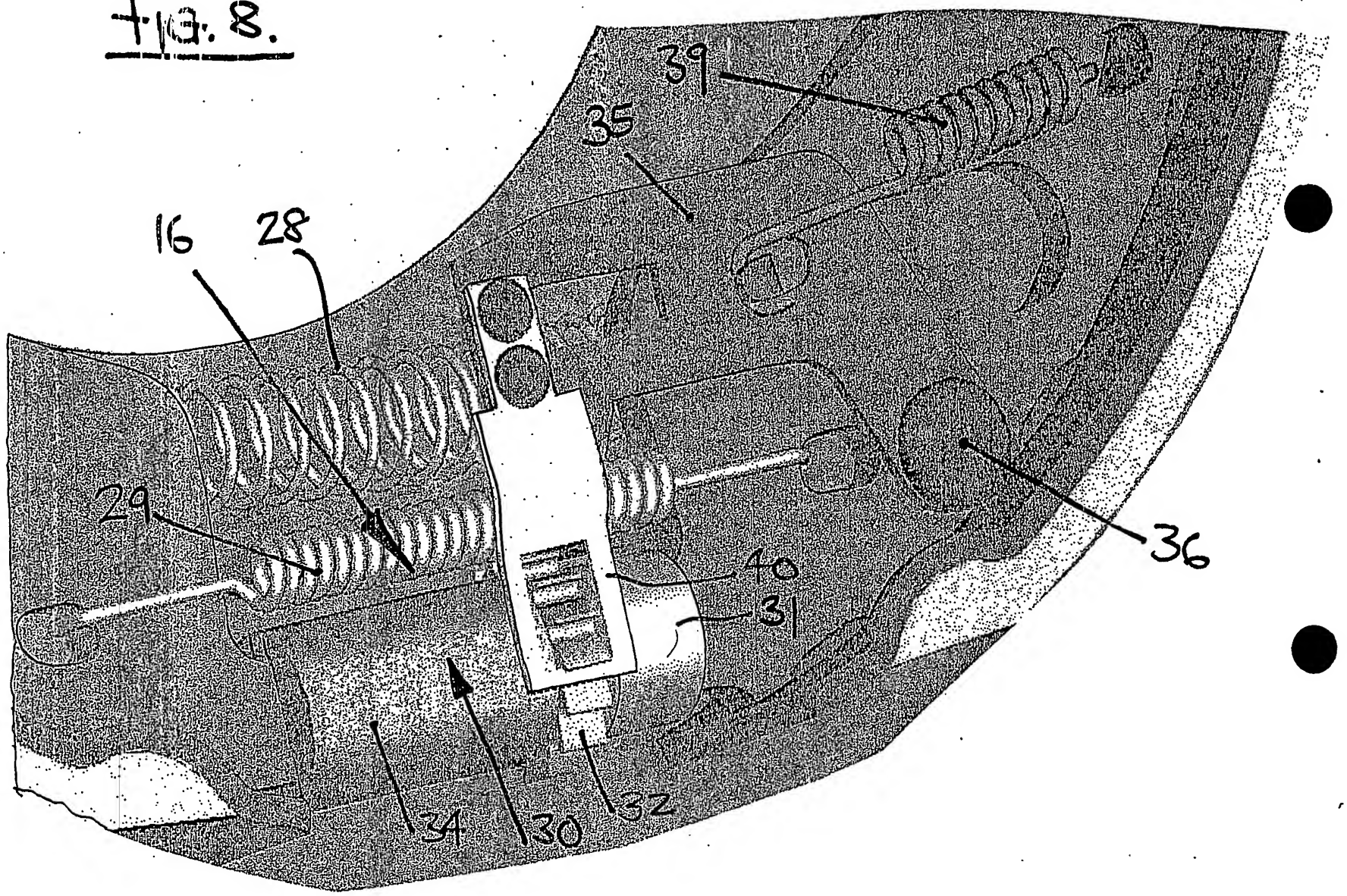


FIG. 7.

Fig. 8.



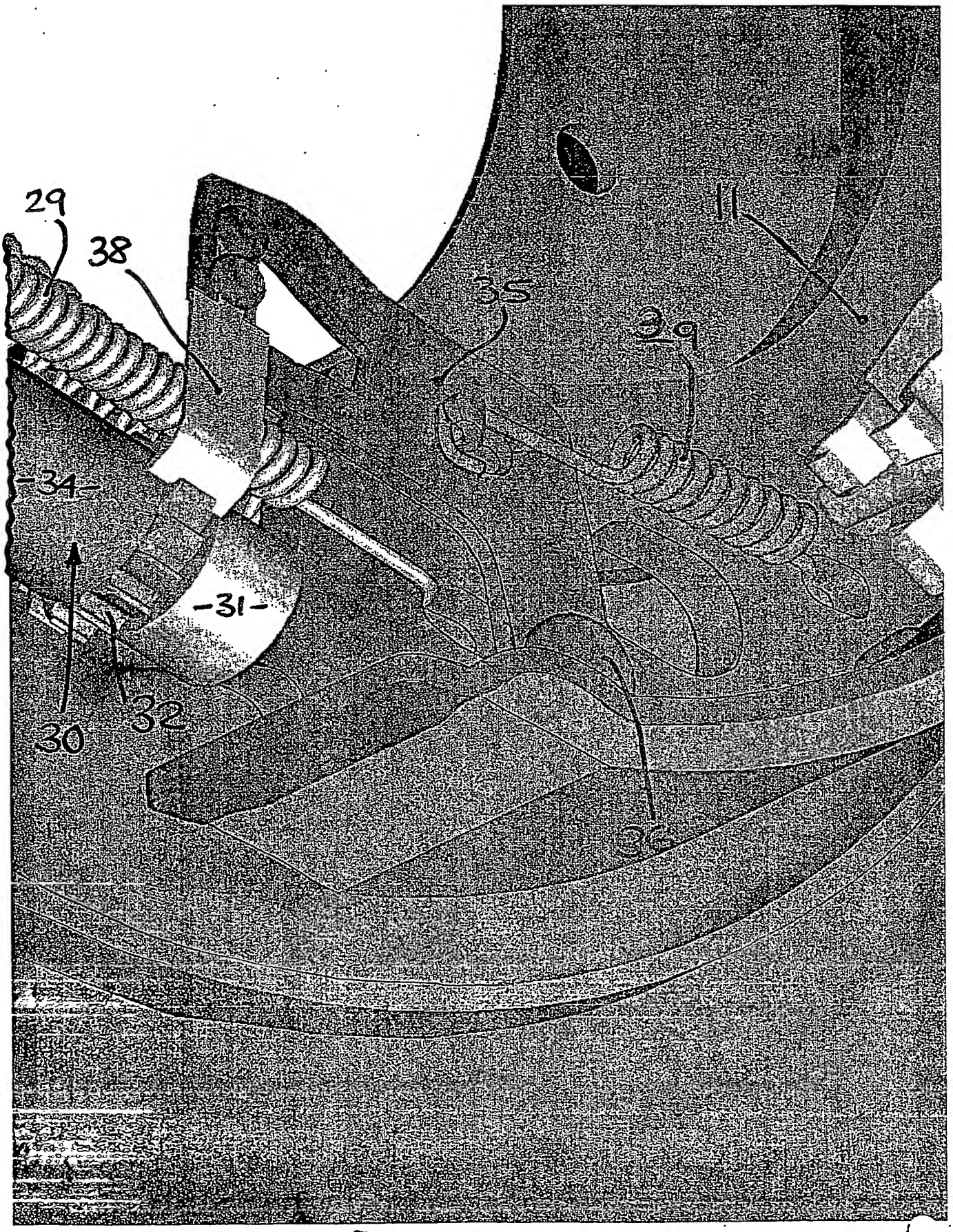


FIG. 9.

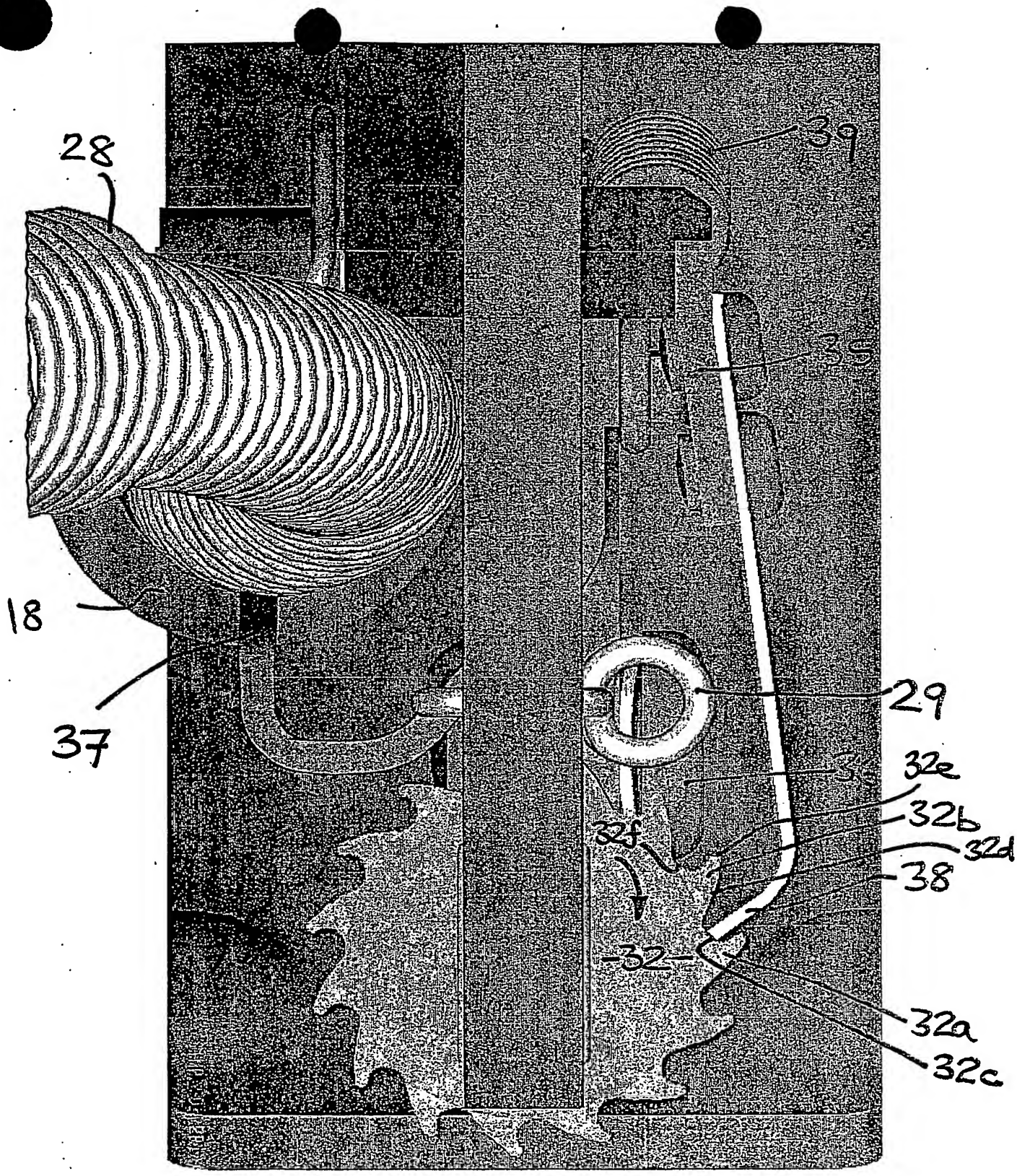


FIG. 10.